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Description

Sealing strip for the frame structure of a vehicle

The invention relates to a sealing strip according to the preamble to Claim 1.

Such sealing strips are intended to co-operate with the movable pane of the window opening of a vehicle, which pane can move between an open and a closed position. They are used in the region of the C-columns, but also the roof frame of folding roof covers, hardtops and retractable hardtops. The sealing elements come more or less into sealing abutment with the edge regions of the pane depending upon the state of opening of the pane.

As a rule the sealing elements are constructed in such a way that sealing lips are provided on both sides of the pane and butt with a defined prestressing against the pane. This prestressing is designed so that sufficient sealing force is provided but the unavoidable wear is kept within limits.

In the design of the pivoting movement of the pane between the open and the closed position, limiting conditions must be heeded which are contingent upon the configuration of the space available within the door construction. This is often restricted by the wheel cases, so that simple vertical movement of the pane is frequently impossible and a pivoting movement therefore must be arranged which is adapted to these spatial restrictions. This situation must also be taken into account in the design of the sealing strip, namely with the object of ensuring that the sealing lips uniformly cover the pane on both sides as a function of the state of opening of the pane along the pivot curve which is fixed by the design.

A further limiting condition for the sealing strip results from the spatial curvature of the window boundary defined by the respective vehicle.

In the applicants' firm integral sealing strips are known which exhibit a generally U-shaped construction in cross-section and can be fixed on the frame structure of a vehicle, in this case

a window enclosure, by way of a central base section. These sealing strips arrive at the vehicle assembly line in this form, that is to say as a finished product. Because of the aforementioned pivot curve which has to be arranged for the pane, this space - when viewed along the sealing strip - has different depth dimensions so that because of the poor accessibility it is frequently very difficult to carry out subsequent work on functional surfaces which are usually disposed within this space. In individual cases this can lead to reductions in quality and even to defects in the end products.

From the located document WO 00/03885 A a sealing strip is known which is arranged for mounting on a frame structure of a vehicle, is intended for co-operation with a pivotable pane of a window and forms a space which is generally U-shaped and arranged to receive the pane. The free ends of the cross-sectional structure are each provided with a sealing lip which is intended for sealing abutment on the edge. The said cross-sectional structure is composed of two L-shaped parts, the base parts of which overlap and the side parts of which form the lateral boundaries of the cross-section. The base parts are fixed relative to one another by positive locking, and at the same time are firmly fixed to the frame structure of the vehicle by screwing.

From the located document FR 2 743 028 A a comparable sealing strip is known which has a U-shaped cross-section and is generally composed of two L-shaped frame parts which are made from thermoplastic plastics material and jointly bear a sealing element which on its free ends forms sealing lips which are intended for lateral abutment on the pane of the doors of a motor vehicle. By way of a central intermediate portion in the form of a membrane the sealing element connects the base portions of the frame parts, wherein this intermediate portion is dimensioned in such a way that the frame parts are spaced from one another in the unmounted state of the sealing strip. However, the installed state of this sealing strip is characterised in that the two frame parts are firmly connected to one another by way of their base portions which are of complementary construction in the manner of a tongue-and-groove joint, so that the membrane-like connecting portion arches into the interior of the U-shaped cross-section and forms a resilient abutment strip for a pane introduced into this space.

The sealing strip which is known from the located document DE 195 31 600 A1 is characterised by an integral U-shaped rail, the free ends of which are connected to sealing lips which protrude into the U-shaped cross-sectional space and are intended for sealing abutment on the pane of the doors of a motor vehicle. The said rail is fixed by screwing of one of the two flanks to a flange-like frame structure of the vehicle, the screw connection being designed in such a way that adjustment in the vertical and longitudinal direction of the vehicle is possible.

All of these known sealing strips are characterised in that the dimensions of the U-shaped receiving structure for the pane are in fact predetermined by the design and are not adjustable. This means that accordingly the contact pressure of the sealing elements or of the sealing lips is likewise determined by the dimensions, the shape and the material. In the case of these designs, if the resulting contact force is inadequate or irregular there are no corrective measures available which can be carried out simply in terms of cost.

One requirement for variation of the contact pressure results from the predicted future use of vehicle wash installations in which brush arrangements which move in a rotary or linear fashion are omitted and instead of these systems nozzle arrangements are used from which a cleaning fluid emerges under high pressure. In individual cases sealing arrangements in the window region have proved unsatisfactory in order to withstand the pressure of the impacting cleaning fluid.

The object of the invention is to design a sealing strip of the generic type described above with a view to a qualitatively uniform and reproducibly good end product and also with a view to subsequent changes to the setting. This object is achieved in such a sealing strip by the features of the characterising portion of Claim 1.

First of all it is essential to the invention that the two shaped parts which surround the space of U-shaped cross-section in the sealing strip are in the form of components which are separate from one another and thus arrive at the vehicle assembly line in this separated state. Thus operations which occur after the shaping of the shaped parts can be carried out

unhindered by the shape of the sealing strip, so that the production problems which are associated with the restricted accessibility of working surfaces within the said space and its changing depth - when viewed along the sealing strip - do not even occur at all. Thus both shaped parts can be processed separately from one another until the end product stage is reached. This opens up advantageous possibilities for the provision of a reproducible product quality.

It is also an essential feature of the invention that at least one of the two shaped parts - when viewed in a direction perpendicular to the surface of the pane - is adjustably fixed on the frame structure or a window enclosure. This means that the contact pressure with which the sealing lips are applied to the pane can be varied by adaptation of the position of at least one of the shaped parts. In this way an irregular contact pressure, irrespective of its cause, on both sides of the pane can be changed or compensated for in a desired manner. Furthermore, in so far as this can be combined with a limitation of the wear and also in circumstances in which it is difficult to operate the opening and closing process of the pane an increased contact pressure can be set so that problems with high-pressure car wash installations are reliably avoided.

According to the features of Claim 2, processing of functional surfaces, e.g. sealing surfaces, can comprise the application of coatings for example in the form of antifriction varnish, fibre coverings, etc.

According to the features of Claim 3 the sealing strip has a spatially curved configuration, wherein the depth dimension of the space with a U-shaped cross-section changes from one end to the other. The spatial curvature as well as the type of change of the said depth dimension are determined by the design data of the respective vehicle.

The features of Claim 4 are directed to one example of an embodiment of the sealing strip which is simple to implement. At least the shaped part which is disposed so as to be adjustable perpendicular to the pane has an L-shaped cross-section and comprises a base part and a side part, wherein the former is arranged for fixing on the frame structure. The shaped

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parts are mounted independently of one another on the frame structure and are not directly connected to one another in any case.

The features of Claims 5 to 8 are directed to a further embodiment of the sealing strip in terms of design and materials. Accordingly it is connected to the frame structure with the proviso that the space delimited by the sealing strip is in any case reliably sealed and protected relative to the outer space. Accordingly the shaped parts can be made from a plastics material, a metal, e.g. high-alloy steel sheet, or in one case from plastics material and in the other case from a metal. Depending upon the dimensions and the structure of the shaped parts an improvement in stability may be expected in the case where the part is made from plastics material over an arrangement of reinforcing ribs.

Due to the releasable fixing of the shaped parts on the frame structure according to Claim 9 subsequent interventions are also possible, in particular readjustments of the sealing lips.

According to the features of Claim 10 the shaped parts are constructed so that they are spatially curved in a manner which is dependent upon the respective vehicle.